

FEB 24 1997

ACTION: Nebraska and South Dakota Road
Closure Gates

Chief, Federal-Aid and Design Division

HNG-14

Mr. Arthur E. Hamilton
Regional Administrator (HEO-07)
Kansas City, Missouri

This is in reply to your December 13, 1996, memorandum requesting the Federal Highway Administration's (FHWA) acceptance of the Nebraska road closure gate as meeting crashworthiness requirements for use on the National Highway System (NHS). Transmitted with your memorandum was a report dated January 1995, of tests conducted on a South Dakota road closure gate at the Midwest Roadside Safety Facility (MWRSF) and an analysis by Dr. Dean L. Sicking of the Nebraska version of the gate.

Both gates are built of square tubular aluminum, and are mounted on breakaway posts. The South Dakota design is 8.5 meters long and the Nebraska design is 11 meters long. Drawings of both gates are attached, along with a drawing and description of the breakaway hardware common to the support and end posts for both gates. Your request was for FHWA acceptance of the Nebraska modification. However, since this office had not previously reviewed the crash testing of the South Dakota design, we will take this opportunity to examine and act on both gate designs.

Full-scale crash testing was conducted to assess the breakaway performance of the 8.5-meter-long South Dakota road closure gate. It was tested in the "open" position, as this was considered the most likely "worst case" condition. It was also tested with the gate downstream of the principal support post.

Requirements for breakaway supports are found in the American Association of State Highway and Transportation Officials' (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. These specifications have been adopted by the FHWA. Guidelines established in the National Cooperative Highway Research Program (NCHRP) Report 350 were used to conduct the tests and analyze their results.

A summary of the crash tests of the South Dakota design, and estimated values for the Nebraska Design are presented below:

| Test Number | Target Values | SDG-1 | SDG-2 | NEB LO* | NEB HI* |
|------------------------------|---------------|-----------|-----------|-----------|-----------|
| Test Article Mass, kg | n/a | 68 | 68 | 91 | 91 |
| Gate Length, m | n/a | 8.5 | 8.5 | 11 | 11 |
| Vehicle Mass, kg | 820 | 794 | 794 | 794 | 794 |
| Impact Speed, km/h | 35.0 or 100.0 | 37.1 | 95.5 | 35 | 100 |
| Breakaway Device | n/a | Transpo** | Transpo** | Transpo** | Transpo** |
| Bolt Circle Diameter, mm | n/a | 36 | 36 | *** | *** |
| Occupant Impact Speed, m/s | 5.0 maximum | 3.1 | 4.2 | est 3.3 | est 4.6 |
| Vehicle Velocity Change, m/s | 5.0 | 3.6 | 3.7 | -- | -- |
| Stub Height, mm | 100 maximum | 76 | <100 | **** | **** |

*These two columns contain the values estimated by Dr. Sicking of the MWRSF. This design was not crash tested.

**Model No. 201 Pole-Safe ® (1-inch, frangible, die cast aluminum couplings produced by Transpo Industries, Inc.)

***Bolt circle diameter was not specified. However, it is recommended that the same bolt layout pattern be used as was crash tested.

****Transpo Couplings can be expected to leave stubs no greater than 100 mm.

The results of the tests SDG-1 and SDG-2 meet the change-in-velocity and stub-height requirements adopted by the FHWA. The South Dakota road closure gate is, therefore, acceptable for use on the NHS, within the range of conditions tested, if proposed by a State. All posts supporting the gate in the open and closed positions are to be of breakaway designs. Note that one of the test conditions was the impact direction. Thus, it is not acceptable for use where it can struck head-on, on the opposite end from the test impact end. We concur that the estimated values for the Nebraska design are within our requirements and it is also acceptable for use, with the same orientation limitation as that for the South Dakota design.

Our acceptance is limited to the breakaway characteristics of the slip-base mechanism and the crashworthiness of the gate installations, and does not cover their structural features.

Presumably the States will develop sufficient information on structural design and installation requirements to ensure proper performance.

Dwight A. Horne

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Attachments

Federal Highway Administration

HNG-14:NArtimovich:366-1331:gmorton:2-19-97:R7

copies to:

HNG-1 HNG-10 HNG-14 Reader, 3128 File, 3128

RAS HFL-1 HSR-20 HHS-10

Geometric and Safety Design Acceptance Letter Number LS-46